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ABSTRACT

To determine whether story mapping would improve reading comprehension, five intermediate grade students with mild learning handicaps and poor comprehension were prepared to use story mapping procedures as a schema-building technique. As they were reading, students learned to identify the setting, problem, goal, action, and outcome of narrative stories. The primary dependent measure was a set of responses to ten explicit and implicit comprehension questions. Secondary dependent measures were length of story retell, a comparison of story retell responses to comprehension question responses, standardized reading tests, generalization probes, and listening comprehension. Results showed performance of all five students improved on most of the dependent measures. Four students demonstrated increased ability to answer comprehension questions, maintained performance after intervention, and increased tendency to mention story mapping components in their story retells. The remaining, and much slower, student improved marginally on most measures, despite the fact that his slow progress did not enable him to complete a maintenance phase. Three students' performance also improved on comprehension of more difficult classroom reading materials. Five pages of references, and tables and graphs are appended. (Author/HOD)

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CENTER FOR THE STUDY OF READING

Technical Report No. 352

THE EFFECTS OF TRAINING IN STORY MAPPING PROCEDURES ON THE READING COMPREHENSION OF POOR READERS

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Abstract

In a multiple baseline ABA design, five intermediate level, elementary students with mild learning handicaps and poor comprehension were prepared to use story mapping procedures as a schema-building technique to improve reading comprehension. The primary dependent measure was a set of responses to ten explicit and implicit comprehension questions. Secondary dependent measures were length of story retell, a comparison of story retell responses to comprehension question responses, standardized reading tests, generalization probes, and listening comprehension. Performance of all five students improved on most of the dependent measures. Four students demonstrated increased ability to answer comprehension questions, maintained performance after intervention, and increased tendency to mention story mapping components in their story retells. The remaining, and much slower, student improved marginally on most measures, despite the fact that his slow progress did not enable a maintenance phase to occur. Three students' performance also improved on comprehension of more difficult classroom reading materials. The reason for the lack of improved generalization in the remaining two students is not known but may have been due to classroom materials being more difficult than those used for instruction or to an overall lack of generalization ability in some learners.

The Effects of Training in Story Mapping Procedures on the Reading Comprehension of Poor Readers

The ability to read competently is dependent upon sufficient text comprehension in order to construct appropriate meaning. Because substantial numbers of people never acquire this ability, reading scholars have focused much of their attention on trying to understand the reading comprehension process as well as to develop ways to improve poor comprehension.

The latter was the intent of this study, based on two very important influences upon text comprehension described by those interested in the comprehension process. The first, a reader-related variable, has to do with a schematic theory of how readers understand what they read (Bartlett, 1932). The second, a text-related variable, has to do with the underlying structure or story grammar of the text (or story) itself (e.g., Stein & Glenn, 1979). The intervention, a story-mapping procedure, centered around teaching poor comprehenders to develop an organizational framework for thinking about narrative stories that was related to the basic structure of the story. The influences of both of these variables will be discussed, followed by a description of the prominent features of this intervention study.

Schema Theory

A schema represents a person's accumulated information that is associated with an object, action, event, or other entity. Schemata are assumed to guide the encoding and retrieval of story information (Bartlett, 1932). According to schema theory, the correspondence between a reader's underlying knowledge structures (schemata) and the textual

material determines the extent of comprehension. If the relevant schemata have led the reader to make appropriate inferences, then the textual material makes sense to the reader and is assimilated (Anderson, Reynolds, Schallert, & Goetz, 1977). Spiro (1980) asserted that instruction should address the building of knowledge structures at three levels: first, awareness of the nature and limitations of existing schemata; second, the ability to use the schemata efficiently and effectively within those limitations; and third, awareness of the relationship between existing schemata and the reading materials.

These levels have been translated into two general classes of intervention strategies: those designed to activate schemata and those for building schemata. When schemata are activated, readers are made aware of the general and interpretive knowledge they have, and are taught to make use of this knowledge before and during reading. Short and Ryan (1983) described the problem of poor readers of this type as being an under-utilization of existing schemata. When teachers and researchers use schema activation, they devise ways to encourage readers to use existing schemata. Examples of schema activation include making predictions (Hansen & Pearson, 1982), making inferences (Pearson, Hansen & Gordon, 1979), previewing text (Idol-Maestas, 1985), and evaluating text (Brown, 1975).

In contrast with making readers aware of their knowledge, schema building strategies provide readers with a basic framework for organizing and storing information. Readers with problems in this area do not have available information to help them understand text. When schema building is used, an organizational structure is imposed upon the reader in an attempt to help the reader form categories of strong relevant information derived from textual reading.

The schemata, themselves, can be divided into at least three different classes: (a) knowledge about the topic addressed in the text (content schemata), (b) knowledge about how texts are organized (structural schemata), and (c) knowledge of the metacognitive process of merging content and structural schemata (see Gordon & Pearson, 1983). Activation and building of this metacognitive, merging process has been recently exemplified by Palincsar and Brown (1983), who used teacher modeling and reciprocal teaching to teach poor comprehenders to question and summarize as they read, and by Wong (1979) who taught poor comprehenders to self-question as they read.

When content schemata are used, the reader engages in filling in information gaps (slot-filling) not provided by the text and, thus, directs text-connecting inferences. Schema activation strategies are likely to focus on utilizing these content schemata.

When a reader lacks structural schemata, schema building approaches might be used to develop highly structured and concrete guides for readers to use. Gordon and Pearson (1983) compared a content structure approach to an inference awareness approach, as a means of improving comprehension of normal and poor readers. Better performing students did better with either approach but poorly performing students showed little improvement with either strategy. These authors concluded that it may be too difficult for poor readers to see relationships between text and inferencing. Dickensen and Weaver (1979) have also supported the position that poor readers have underdeveloped story structures. We suggest that such poorly performing students might be brought to realizing text/inference relationships if the instruction is very concrete and focuses directly on text structure.

Story Grammars

The concept of the influence of structural schemata upon text comprehension has been widely used in the past decade by researchers studying the internal structures or story grammars of stories (i.e., see Brown, 1975; Rumelhart, 1975; Kintsch, 1974; Mandler, Johnson & DeForest, 1976; Paris, 1976). Stein and Glenn (1978) described narrative story schemata as being comprised of two major categories: the setting (characters and story context) and the episode system of the story (initiating events, internal responses, plans, actions, consequences, and reactions). They described the most salient features as being major settings, initiating events, goals, and consequences.

Singer and Donlan (1983) used generic questions involving character, goal, obstacles, outcome, and theme, as a framework to teach eleventh-grade readers to formulate questions that were specific to each of six complex short stories. Results indicated that the procedure was effective in improving the reading comprehension of these students, and that their success was partly attributable to increased ability to select and organize story events. As mentioned earlier, Gordon and Pearson (1983) found that, for fifth grade readers, instruction in story structure components of setting, problem, goal, attempts, internal response, and resolution resulted in improved general reading comprehension and recall. Most importantly, Short and Ryan (1982) trained less skilled and skilled readers to use a story grammar strategy, demonstrating that the groups did not differ in their ability to utilize story schemata to aid in comprehension of new information, once the strategy was acquired.

Story Mapping

Similar to Stein and Glenn's text structuring, but less complex, Beck and her colleagues (Beck & McKeown, 1981; Beck, McKeown, McCaslin & Burkes, 1979) have characterized narrative text structure as consisting of setting, problem, goal, and resolution; interposed between problem and resolution are the significant events that contribute to the goal, or resolution of the problem. These authors have developed a procedure for mapping stories by identifying each of the components as a means of developing or questioning taxonomy for stories. Pearson (1982) has elaborated on this work by developing a pictorial display that indicates the relationships among these components; a modified version of this appears in Figure 1. Both Beck et al. and Pearson recommended that story maps be used by teachers and basal reading publishers as guides for the generation of questions for narratives. We speculated that low achieving, special needs students might need something more concrete than a framework of questions, so we used the pictorial story map as the organizer for readers to use by filling in the map components as they read. The basic premises for the following study were that (a) the organization that underlies text structure can be generalized to all texts (Gordon & Pearson, 1983), and (b) that poor comprehenders can be taught to understand stories by using a simple story structure as an organizational framework.

Prominent Features of the Study

It was also anticipated that poor readers would need very precise teacher presentation and feedback techniques coupled with multiple opportunities for practice. The teacher presentation style used in this study adheres to a model-lead-test paradigm (Carnine & Silbert, 1979) where first, teachers model the desired response, then they respond with the

student, followed by a student's independent response. Teacher feedback includes both immediate correction of comprehension errors during the lead phase and immediate correction of miscue errors during reading of stories. Records were kept of accuracy of decoding and word analysis to ensure that the subjects in the study could read (decode) the story adequately. Previous attempts to use these types of direct instruction procedures have resulted in a large number of reading disabled students acquiring significantly improved reading skills (Idol-Maestas, Ritter & Lloyd, 1983) with maintained improvement over time (Idol-Maestas, 1982).

An A_1BA_2 single-subject design was used for each subject so that initial data could be collected prior to subjects being offered practice in story mapping (baseline performance or condition A). This design allows investigators the assurance that subjects continue to be poor at comprehension until intervention training is received. The B condition reflects the actual training in the story mapping; condition A_2 was a return-to-baseline condition, testing the maintained effect of the intervention after its removal (refer to Hersen & Barlow, 1976 and Kazdin, 1982 for explanation of the validity of this design). Use of single-subject design is especially important for experimentation with poor readers because it allows the investigator the advantage of knowing exactly how the problem persists prior to intervention and over time, and the precise effects of the intervention on <u>each</u> subject studied, as well as the after-effects of training. For this type of work this design is superior to an experimental/control subject design, where it is anticipated that the majority of the subjects will improve as a result of intervention; it is not necessary for <u>all</u> experimental subjects to improve in order to obtain significant group effects. In contrast, in single-subject designs, each subject serves as his/her own control via the baseline measurement.

The control for this study was further strengthened by use of a multiple-baseline across subjects design, where each subsequent subject's baseline performance is extended longer than that of the preceding subject's baseline. This demonstrates that as time is extended prior to intervention, subject performance continues to be inadequate.

Finally, the possible effects of story mapping on comprehension were measured in several ways. Major consideration was given to use of story retell prior to asking of questions; this method helped to ensure that a measure of a subject's immediate recall was obtained prior to asking questions, which otherwise may serve as a prompt to aid recall. It was equally important to determine whether there was any generalizability of improvement in comprehension to other significant areas such as listening comprehension, performance on standardized tests of reading, and reading of more difficult materials used in each subject's classroom reading program.

Method

Subjects

The subjects were five students from three elementary schools in a medium-sized midwestern city. They were selected by their respective special education teachers because they exhibited serious reading comprehension problems during classroom instruction, despite adequate skill in decoding. The students were: one black male fifth-grader, aged 10 years 0 months, one white female fourth-grader, aged 10 years 7 months, one white male second-grader, aged 9 years 5 months, one black female fifth-grader, aged 9 years 11 months, and one white female fifth-grader, aged 12 years 11 months. Full scale intelligence test scores on the WISC-R were 87 for the first and fifth students, and 89 for the second and fourth students; the third student's parents would not release his IQ score.

Four of the students received services from learning disabilities resource teachers; the third student had been placed in a self-contained classroom comprised of students who exhibited learning disabilities, behavior disorders, and/or educable mental handicaps. These demographic data are displayed in Table 1.

Insert Table 1 about here.

Teachers

The five students were assigned individually to four master's level students with teaching experience, who were enrolled for studies in the Resource/Consulting Teacher (R/CT) program in the Department of Special Education at the University of Illinois. Prior to the initiation of the study, the teachers were trained, in a modeling and practice format, in all relevant procedures: curriculum-based assessment, charting, error correction, word accuracy, reading rate, comprehension accuracy, and story mapping.

Curricular Placement Procedure

The teachers administered a curriculum-based assessment in the Ginn (1982) basal reading series. Following the procedures described in Idol-Maestas (1983), students read orally three similar passages on three separate days, randomly selected from the first quarter of each of five readers of ascending grade levels, the highest being their current classroom grade level. The sample passages were at least 100 words in length, and were followed by five comprehension questions. The students were timed for reading rate (correct words per minute; cwpm) and accuracy on the first 100 words.

The comprehension questions consisted of two factual questions (answers were explicitly stated in the text), one sequential question (containing the word when, before, or after), and two inferential questions (answers required integration of ideas not explicitly stated in the text). Reading accuracy for the 100-word passage was expressed as a percentage, by subtracting from 100 the number of omissions, substitutions, additions, teacher assists, and pauses of more than five seconds (Idol-Maestas, 1983). Reading rate (cwpm) was calculated by multiplying the percentage accuracy by 60, and dividing by the time (in seconds) it took the student to read the passage.

An attempt was made to place students at the level of reader to which three median performance criteria were most closely matched: 95% word accuracy (Harris & Sipay, 1975); 50 cwpm for fourth grade reader or above, and 30 cwpm for third grade reader or below (Idol-Maestas et al., 1983); and less than 75% reading comprehension (Pikulski, 1974). Where accuracy and rate criteria were not met (see Table 1), the decisive factor in assigning reader level was that level at which a student's reading comprehension was poor, with rate and accuracy being as high as possible.

Instructional Procedures

Design. The experimental design was ABA, with multiple baseline across the five students. The students were randomly assigned to four, seven, eight, ten, and seven days of baseline, respectively.

Baseline conditions (A). During baseline conditions, student performance on the dependent variables was monitored in order to provide a contrast with intervention conditions. Only stories that had a discernible story structure were selected; poems and expository passages were omitted. Each student read a story (or segment) orally for 20 minutes

each day, from the appropriate Ginn (1982) reader indicated by curriculum placement procedures. The teacher used a specific procedure for correcting errors (see Idol-Maestas et al., 1983 for details); errors were corrected as they occurred, except during the 100-word timed sample, which was collected daily to monitor reading accuracy and rate. After finishing the story (or segment), the student was tape recorded while retelling the story in detail from memory. The teacher then asked the comprehension questions listed in Table 2, to which the student responded orally; questions whose answers could not be derived from the text were not posed. Reading errors that had occurred during the timed sample were corrected after the comprehension questions had been answered.

Insert Table 2 about here.

Intervention conditions (B). During intervention, each story was read in the same manner as it had been during baseline conditions. During the first two days, the teacher familiarized the student with the story map (illustrated in Figure 1) prior to the reading, and stopped the student at a point where information arose that pertained to any of the story map components, as the student was reading. The teacher then asked

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Insert Figure 1 about here.

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the student which component had been read, and provided the correct response if the student responded incorrectly. Where a component had to be inferred from the text, the teacher showed the student the pertinent information from which to derive that component. The student wrote the

correct response directly onto the story map outline. This was the Model phase.

During the remainder of the intervention phase (Lead Phase), the student independently filled in the details of the story map, with prompting from the teacher when necessary. If story map information occurred during the timed sample, the student did not interrupt the reading, but filled in the mapping component after reading the timed sample. In addition, the student was encouraged to review the map after story completion, adding any details that may have been omitted. Because the third student had difficulty in writing on the map, a second intervention phase (C) was added, wherein the teacher wrote this student's oral response on the story map.

After the student had finished reading the story (or segment), baseline procedures of story retell and comprehension questions were followed.

Maintenance conditions (A). When stability at or above criterion level of 80% correct comprehension was reached by a student, the story map procedures were stopped. Baseline procedures were again followed, to assess the degree of maintenance of comprehension. This was the Test Phase.

Dependent Measures

The primary dependent measure was the percentage of correct responses to the ten comprehension questions asked after each story (or segment) had been read.

Length of story retell was measured by the second, third, and fourth dependent variables which were the number words, clauses, and sentences. In identifying word count, repetitions and extraneous utterances were not included. Contractions were counted as two words, with the

exception of n't. A clause was defined as set of words, which contained a verb, verb phrase, or verb form such as participle, gerund, or infinitive. A sentence was defined as at least one main clause, with or without subordinate clauses, ending with a full stop (marked by a voice drop on the tape). When a number of main clauses were joined by and, one sentence was counted for each pair of clauses.

The fifth dependent variable was a measure of the quality of story retells. Each retell was analyzed for incidence of mapping components mentioned by the student. The resultant data were further compared with the oral comprehension data that had been collected on the corresponding story, looking for possible correspondence between mention of mapping component in retell compared to correctness of the response to the question asked about that component.

The sixth and seventh dependent measures were performance on two standardized reading tests. On the two days prior to the curriculum-based assessments, the teachers administered the reading comprehension subtests of the Stanford Diagnostic Reading Test (Karlsen, Madden, & Gardner, 1976) and the Nelson Reading Skills Test (Hanna, Schell, & Schreiner, 1977). On the two days immediately following the maintenance phase, the same tests were administered. Grade equivalents were calculated for raw scores of all students.

The eighth dependent measure consisted of generalization probes, taken during each of the baseline and maintenance conditions. Each time, the student read orally an unfamiliar story from the basal reader used in the classroom reading program. A 100-word passage was used for rate and accuracy measurement. At the end of the story, the student responded to the applicable comprehension questions listed in Table 2.

A ninth dependent variable was a pre/post-study measure of how well the students could comprehend a passage by merely listening to the teacher read the story, as suggested by B. Rosenshine (personal communication, May, 1983). Several 100-word samples were randomly selected from the final quarter of the Ginn (1982) reader used by each student during the study. These were read to the student by the teacher. The same categories of questions that were used for the curriculum-based assessment were also used for the listening test; scores reflected percentage of correct responses.

Recording and Reliability Procedures

Two doctoral students, acting as field supervisors, observed each teacher at least twice during administration of the curriculum-based assessment and during each experimental condition. They followed the prescribed data collection procedures, as an independent check on the reliability of the data. The teachers plotted the data on multi-band charts, which were checked independently by the supervisors and program coordinator. Inter-rater agreement was 100%. In addition, all standardized test protocols were scored by the teachers, and checked by the supervisors; inter-rater agreement was 100%.

For story retell measures, an independent observer transcribed the tapes. A field supervisor coded the transcripts in terms of mapping components and comprehension question components. To enable post hoc analyses, coding of transcripts also included the number of words, clauses (factual versus inferential), and sentences. Another observer independently coded 20% of the transcripts.

Results

Correct Responses to Comprehension Questions

As shown in Figure 2, 4 of the 5 students demonstrated strong net gains in comprehension from baseline to maintenance phase. The exception was the third student, who exhibited variable comprehension, with a slight upward trend during the second intervention condition (C). Time constraints caused the study to be terminated before his performance became stable; thus maintenance data could not be collected.

Insert Figure 2 about here.

When the first student did not maintain the high level of correct comprehension achieved during intervention condition, this was reinstituted. Since his comprehension became stable above criterion level of 80%, he was again returned to baseline conditions. Overall, he achieved a net gain of just under 50% in correct comprehension.

The second student steadily increased her comprehension during intervention, and showed strong maintenance. The fourth student showed initial variability, then a steady increase in comprehension, with strong maintenance. The fifth student showed sudden and consistent total comprehension during intervention, which maintained strongly (see summary of data in Table 3).

Insert Table 3 about here.

An ANOVA with repeated measures across the four subjects, who completed baseline, intervention and maintenance phases was conducted to

validate overall comprehension improvement. The effect of phases was statistically significant ($F(2,219) = 58$), $p < .001$), with 51% of the variance accounted for ($E^2 = .51$). A posteriori comparison using Scheffe's Tests yielded significant contrasts ($p < .001$) between baseline and intervention phases, as well as between baseline and maintenance phases. As expected, no significant differences were found between intervention and maintenance phases, indicating that improved reading comprehension did significantly maintain after removal of story mapping. A statistically significant difference was also found between baseline and intervention changes for all five students, including the third student, using an ANOVA with repeated measures [$F(1,223) = 109$, $p < .001$, $E^2 = .53$].

Story Retells

The length of story retell of the five students was analyzed in terms of number of words, clauses, and sentences per retell. Means were calculated on five-day intervals. The summary data are presented in Table 4.

Insert Table 4 about here.

Sometime during the intervention phase all but the fourth student experienced large declines in number of words, clauses, and sentences, followed by an eventual rise to a level near or above baseline. Between baseline and maintenance, the first, second, and fourth students had a net gain in story retell length. The third student demonstrated low story retell length on all three measures during baseline. After declining to zero in the first intervention phase, his story retells increased during the second intervention to a near-baseline mean; the trend was upward when

the study ended. The fifth showed a slight increase in the number of words, with no corresponding increase in number of clauses or sentences.

Quality of Story Retells: Comparison of Comprehension Question Responses to Story Retell Components

For each subject, Figures 3 and 4 illustrate the comparison between percent of comprehension questions answered correctly by type, and the equivalent story mapping components mentioned during story retell. Since the data for the second student's responses to specific comprehension questions were irretrievable, only her story retell data are presented.

Insert Figures 3 and 4 about here.

The following represents a summary of analysis of components.

Where. All students showed increased ability to answer location questions. However, only the first student showed a variable improvement in story retells; the remaining students showed no improvement.

When. In general, regardless of the students' performance in answering time questions, they did not show a tendency to mention time during story retell.

Character. All students increased their ability to identify important characters, and showed a corresponding increase in mentioning this component during story retell.

Story goal. Most students showed an improvement in identifying story goal, both for question-answering accuracy and during story retell. The first and fourth students showed an increase in both categories, the fifth student improved during questions and maintained during retell, and

the third student showed a decrease during retell, despite an increase in correct responses to questions.

Story action. The action component improved for all students; occurrence during retell increased for three students, was maintained at ceiling for one student, and decreased for one student.

Story problem. In general, there was direct correspondence between comprehension response accuracy and the mention of the problem component during story retell. The third, and lowest student, did not show this improvement.

Story outcome. Again, there was improved correspondence between question-answering and story retell for most students; the slowest student improved only on question-answering, and the fifth student improved for questions and maintained excellent performance during story retell.

Theme and supposition. Neither theme nor supposition questions were measured during retell, as these were not a part of the story map. The first, fourth, and fifth students showed considerable net gain in both components, while the third student had zero response for supposition, and almost always a zero response for theme.

The following represents an analysis of student performance on components. With the exception of the when question, the first student generally showed a correspondence in occurrence of story components in both comprehension response and spontaneous retell categories; much variability occurred in terms of story retell. The second student showed gains in retell in all components but when and action. Little correspondence existed between the two categories for the third student. An inverse relationship existed for the fourth student in the where, when, and outcome components (i.e., comprehension increased, occurrence during story retell decreased); the other components showed some correspondence.

The fifth student achieved 100% in nearly all components in correct responses, and in all but where and when in story retell.

Interobserver reliabilities were taken for each component subset; reliabilities ranged from +.94 to +1.00 ($p < .001$).

Standardized Tests

Both the Stanford Diagnostic Reading Test and the Nelson Reading Skills Test subtests in reading comprehension were administered as pre- and post-study measures. Student results are presented in Table 3. All but the second student achieved at least a 6-month gain on at least one standardized test of reading comprehension.

Generalization

Using the fifth-grade Houghton Mifflin (1981) reader, the first student maintained high accuracy, increased his average rate, and increased his average comprehension by 50%, on generalization probes. The second student maintained her baseline rate on accuracy and rate, but showed a slight decline in average comprehension, when reading from the fourth-grade Laidlaw (1980) reader.

Using the second-grade Laidlaw reader, the third student increased average scores in accuracy and comprehension, but decreased slightly in rate, on a generalization probe taken four months after the study ended.

The fourth student maintained oral reading accuracy and rate, but decreased in the comprehension measure by an average of 10%, when reading from the fifth-grade Laidlaw reader. Using the fifth-grade Houghton Mifflin reader, the fifth student maintained accuracy and rate, and increased her average rate of comprehension on the generalization measure.

In summary, only the first and fifth students appreciably increased their comprehension, according to generalization measures. The second and fourth students showed some evidence of a decline in comprehension, while the third student was maintaining slightly above his intervention rate four months after the study ended. All five students maintained or increased both their reading accuracy and reading rate.

Listening Comprehension

The results of listening comprehension measures are summarized in Table 3. All five students increased their listening comprehension between baseline and maintenance. The largest gains (40%) were made by the first and fifth students; the third student demonstrated an upward trend while still in intervention conditions.

Discussion

As they were reading, students in this study learned to identify the setting, problem, goal, action, and outcome of narrative stories. All of the students showed improved comprehension on daily reading lessons, suggesting that mapping of story components is an effective way to build structural schemata. In drawing this conclusion it is important to note that daily comprehension did not improve until concretized story mapping was begun, regardless of the baseline lengths of individual subjects. The generic questions were used during this baseline phase, and the questions alone did not result in an improvement. In addition, all students (4 out of 5) who reached a mastery level of 80% correct comprehension, maintained this improvement when no longer using story mapping. This maintained improvement is an especially important indicator that students were continuing to attend to the story components, even though no longer required to locate them in the story. (The student who did not reach maintenance

phase did show improvement on daily comprehension and generalization as well as on several other dependent measures.)

Aside from the demonstrated effect of story mapping via the single-subject design, there were several other indications of improved comprehension. One was that all five students improved on at least one of two standardized tests of reading comprehension. Two students improved on botn tests. There were variable responses for the remaining three students, with one showing improvement only on the Stanford Diagnostic Reading Test, and two only on the Nelson Reading Skills Test. At first it was thought that the variability in these three students' scores could lend support to the issue raised by Jenkins and Pany (1978a; 1978b). These authors provided evidence that one can expect variability of performance test scores across standardized tests of reading. A post analysis of the correlation between the five students' test scores on both tests yielded high and significant relationships (r = .78, p <.04), with both the pretest (r = .78, p <.08) and post-test (r = .83, p <.04) being high and/or significant as well. Given that the test scores were fairly well-correlated, and that improvement was observed on at least one test for every student, one could place some confidence in the improvement on standardized tests. However, the Jenkins and Pany data do support the contention that performance on standardized tests of reading may not be the best measure of how well students read curricular materials. In this study, more confidence should be placed on the primary dependent measure, which was the more direct measure of daily reading performance in curricular materials.

A third indicator was that all five students demonstrated improvement in listening comprehension. Again, the baseline/intervention characteristics of a single-subject design enhances the validity of this improvement. Each student was given individualized listening comprehension tests on

three separate days during baseline conditions; no improvements over time were found, indicating that these students did not listen more attentively merely as a result of practice and individual attention. However, as students learned to identify important story components, they may have begun to attend more closely to the events within a story. In a previous and similarly designed study, which used an advance previewing technique (Idol-Maestas, in press), listening comprehension also improved for five out of six subjects.

A fourth indicator was the length of story retells measured by words, clauses, and sentences. Three out of five students showed overall gains in the number of words, clauses, and sentences used to retell the story. Of the remaining two students, one (fifth) student exhibited considerably higher average baseline scores than the other students, indicating that retell length was not a real problem for her. The other (third) student produced very small numbers of words, clauses and sentences. For the students who improved, there was a noticeable shift from sketchy and brief story retells to longer and more complete retells.

An interesting phenomenon was observed regarding retell length: 4 out of 5 of the students experienced large declines in story retell length at some time during the intervention phase. The reason for this is not known; no other literature has mentioned this phenomenon. In the interests of examining whether length of retell was affected by the frequency of mentioning the mapping components, a comparison was made between the two factors. No consistent pattern was evident across students; all patterns were too individualistic to make any kind of summary statement.

More precise measures of the quality of story retell and effects of mapping were the number of story mapping components that students

actually referred to when telling the story, their responses to direct questions about the components, and a comparison of the two types of responses. Of these measures, the best results were produced by directly asking the questions. In general, if students needed to, they did improve when answering questions about character, goal, action, and outcome of a story. When story problem, theme, and supposition questions presented a problem initially, all but the third student improved their responses. Interestingly, although students were less likely to improve responses about when and where, these components seemed to be the least critical for obtaining an understanding of the main idea of a story. Possibly knowledge about story setting is important for a few unique stories, but not essential for most stories.

When asked to retell stories, there was some increase in the inclusion of the story map components. Improvement for character and goal was shown by students who had low initial correct responses, and all but the third student improved on action. (The fifth student had 100% responses throughout the study.) Only two students improved in relating story outcome, and none improved for when and where. These findings seem to indicate that these students were likely to give correct responses about story components if they were asked directly about them. They were not as likely to spontaneously include this information in a story retell, even though they had just practiced identifying the components as they were reading the story. For instance, of 17 possible times where there was improvement in answering questions about the components of the story, only 47% of the time was there also corresponding improvement on the story retell. This was true when the spontaneous retell occurred prior to using the generic questions to remind the students of the components.

This problem seems to hint at some lack of generalization from practice to spontaneous recall.

These findings indicate that imposing a very concrete, organizational structure upon poor comprehenders positively affects their ability to identify structural schemata of stories. One can expect such poor comprehenders to improve on daily comprehension scores, standardized test performance on some tests of reading comprehension, listening comprehension, and length of story retells (words, clauses and sentences). However, they are much more likely to respond correctly to direct questions about what they have practiced than to spontaneously generate all mapping components in a story retell.

Another very important issue to consider is whether such low-achieving students would generalize learned attending to story schemata to classroom reading materials, which were more difficult than those used for instruction. Three students exhibited improved comprehension when reading in classroom readers, but two students demonstrated slightly depressed comprehension. The only discernible pattern in these findings was that two of the students with improved generalization were reading in the Houghton Mifflin series, while the two with no improvement in generalization were reading in the Laidlaw series.

A post hoc analysis of the readability levels of the three series (Ginn, Houghton Mifflin, and Laidlaw) was conducted, using two readability formulas (Fry, 1968; Harris & Jacobson, 1975). No consistent pattern was observed, other than one of considerable variation of difficulty levels both within and across series. This problem with difficulty variation is probably one reason why readability formulas have been found to be inadequate measures of reading difficulty (Davison et al., 1980). At best, it can be

said that three of the students in this study showed an improvement that generalized to reading classroom materials. For the remaining two students, it is unknown whether they failed to demonstrate improved generalization due to the inherent characteristics of the classroom material, or due to individual students' difficulties with generalization.

Implications

The findings of this study support the position of schema theorists (i.e., Anderson, 1977; Anderson et al., 1977; Spiro, 1980; Spiro et al., 1980) that when the readers possess or are provided with relevant schemata, a relationship can be drawn between those schemata and the reading materials. In this case, an attempt was made to assist poor comprehenders in building a set of generic, structural schemata (the story map components) that could be applied to narrative stories. The result was that all readers improved their comprehension, and maintenance effects were demonstrated for the majority of them. Like the findings of Singer and Donlan (1983), a set of generic questions pertaining to the story map components proved to be an effective measure for eliciting good comprehension responses.

Unlike the findings of Stein and Glenn (1977), teaching story components did not result in corresponding improvement on story retell measures. Stein et al. found that teaching elementary students components such as settings, character, goal, and resolution resulted in improved comprehension in terms of both story recall and story retell. Our findings were that poor comprehenders were twice as likely to improve on story recall using generic questions as on story retell. The subjects in the Stein study were merely poor comprehenders; those in our study had been identified as being learning disabled. These differences were very pos-

sibly due to certain characteristics of mildly handicapped students, such as poor generalization skills (Idol-Maestas, 1983; O'Connor, Stuck, & Wyne, 1979), lowered intelligence, and school-identified learning disabilities.

Future research on development of schema-related techniques for mildly handicapped learners should include descriptive studies, designed to examine possible generalization problems. These should be followed by intervention studies that include carefully-planned strategies to enhance generalization of two types. The first type has to do with situational generalization, where students are taught to give similar responses with a variety of probing techniques. Instructional programs could be developed that teach students to talk about the generic schemata of a story, as a means of demonstrating an understanding of the main idea of the story. The second type of generalization has to do with generalization across instructional materials. For this type of programming, the students would practice reading a variety of materials at varying difficulty levels, as a means of promoting a more durable type of generalization.

Finally, the most important implication of this work is that poor comprehenders, especially those with special education histories, may need a very precise and direct type of comprehension instruction, as demonstrated in the present study, and previously in the work of Idol-Maestas (1985), Palincsar and Brown (1983) and Wong (1979). Teachers cannot expect that gains will maintain over time, and thus should be careful to systematically plan and test for these effects. A prerequisite assumption is that teachers should examine reading materials carefully, in order to expose students to a variety of materials; they should not expect that situational or materials generalization will occur spontaneously.

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Table 1

Demographic/Placement Data

Student	Spec.Ed. Placement	Age	Grade	Sex	Race	IQ (WISC-R)	Curriculum Assessment (Median Scores) Level	Grade	%Accuracy	Rate(cwpm)	%Compre.
First	LD	10-0	5	M	B	87	12	5	95	75	20
Second	LD	10-7	4	F	W	89	8-9	2^{2}-3^{1}	90	40	60
Third	Cross-Cat.	9-5	3	M	W	-	4-6	PP^{3}-1^{1}	80	50	20
Fourth	LD	9-11	5	F	B	89	11	4	89	63	40
Fifth	LD	12-11	5	F	W	87	9	3^{2}	89	42	60

Table 2

Comprehension Questions

1. Who was the story about?
   OR (CHARACTER)
   Who were the main characters?
2. Were there other important people in the story? Who? (CHARACTER)
3. When did the story take place? (SETTING)
4. Where did the story take place? (SETTING)
5. What did _____ (important person) want (or want to do)? (GOAL)
   OR
   What was the problem in the story? (DEFINITION)
6. What did _____ do to try to get what s/he wanted? Explain.
   OR (ACTION)
   How did _____ try to solve the problem?
7. Did _____ have trouble getting what s/he wanted? Explain.
   OR (OBSTACLE)
   Was it hard to solve the problem? Explain.
8. Did _____ get what s/he wanted? Explain.
   OR (OUTCOME)
   Was the problem solved? Explain.
9. What lesson did the story try to tell you? (THEME)
10. Was the ending a surprise? Explain.
    OR (SUPPOSITION)
    Could there have been a different ending?

Note. The authors developed the questions based on input from Bonnie Armbruster and Ann Brown, Center for the Study of Reading, and Laura Kurland, Department of Special Education; all from the University of Illinois at Urbana-Champaign.

Table 3

Performance on Selected Dependent Measures

Student	Phase(Days)	Mean Percentage Comprehension A	B	C	A	B	A
First		26.25 (4)	78.16(61)	-	72.50(8)	85.00(18)	75.00(5)
Second		55.71 (7)	81.18(33)	-	87.20(5)	-	-
Third		28.63 (8)	39.89 (9)	47.13(25)	-	-	-
Fourth		41.50(10)	83.86(43)	-	86.67(6)	-	-
Fifth		73.14 (7)	100.00 (8)	-	96.00(5)	-	-

	Standardized Tests						Listening Comprehension(%)			
	SDRT			Nelson						
Student	Pre	Post	Change	Pre	Post	Change	Phase:	Pre	Post	Change
First	2.6	3.4	+0.8	3.4	3.4	0		40	80	+40
Second	3.1	3.0	-0.1	1.8	2.0	+0.2		67	80	+13
Third	K	0.6	+0.6	0.2	0.9	+0.7		27	53	+26
Fourth	3.4	3.6	+0.2	1.6	3.0	+1.4		40	53	+13
Fifth	3.7	3.7	0	3.9	4.7	+0.8		60	100	+40

Generalization

Student	Phase	Series	Grade	Accuracy(%) A	B	A	Rate(cwpm) A	B	A	Comprehension(%) A	B	A	Change
First		Houghton Mifflin	5	99	99	97	76	84	92	40	50	90	+50
Second		Laidlaw	4	86	87	86	23	26	25	70	56	60	-10
Third		Laidlaw	2	82	90	91*	33	63	55*	40	30	44*	+4
Fourth		Laidlaw	5	91	-	92	70	-	74	50	-	40	-10
Fifth		Houghton Mifflin	5	93	90	89	33	35	38	70	100	90	+20

Inter-rater Agreement ($p < .001$) $r = .99$ $r = .99$ $r = .97$

*Follow-up probe 4 months after study ended.

Table 4

Mean Lengths of Story Retells Across Subjects as Measured by Words, Clauses, and Sentences

Subject/ Phase	WORDS						CLAUSES						SENTENCES					
	A	B	C	A	B	A	A	B	C	A	B	A	A	B	C	A	B	A
1	60	91	--	54	71	87	10	16	--	12	18	15	3	8	--	4	6	6
2	72	85	--	78	--	--	10	15	--	13	--	--	6	7	--	7	--	--
3	11	0	9	--	--	--	2	0	1.3	--	--	--	1.6	0	1	--	--	--
4	22	30	--	44	--	--	3	6	--	9	--	--	1.5	3	--	4	--	--
5	143	127	--	157	--	--	33	27	--	33	--	--	11	8	--	10	--	--
Interobserver Reliabilities	r = .99 (p .001)						r = .99 (p .001)						r = .99 (p .001)					

Figure Captions

Figure 1. Outline of story mapping components.

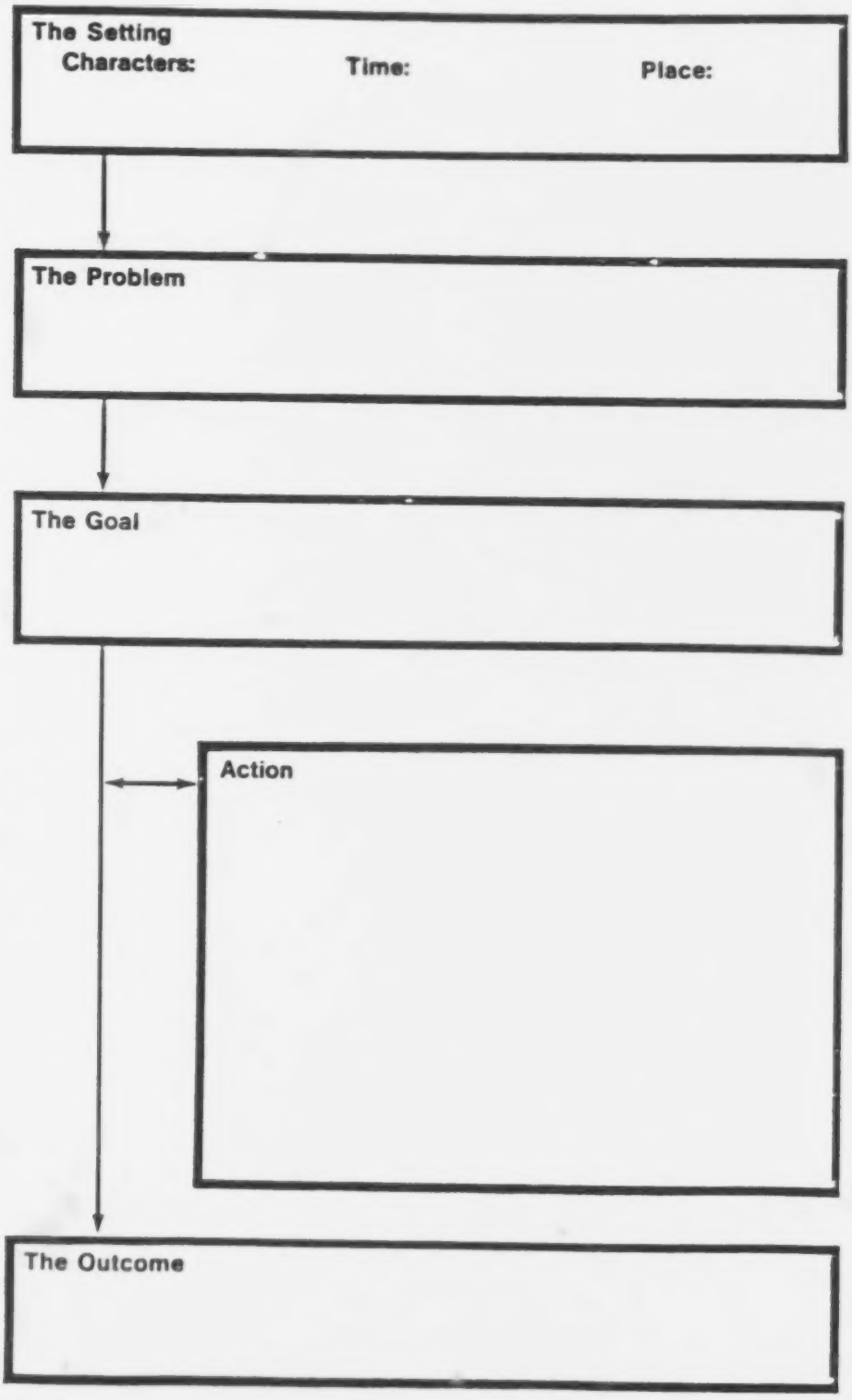
Figure 2. Percent of correct comprehension across phases with multiple baseline for five elementary students.

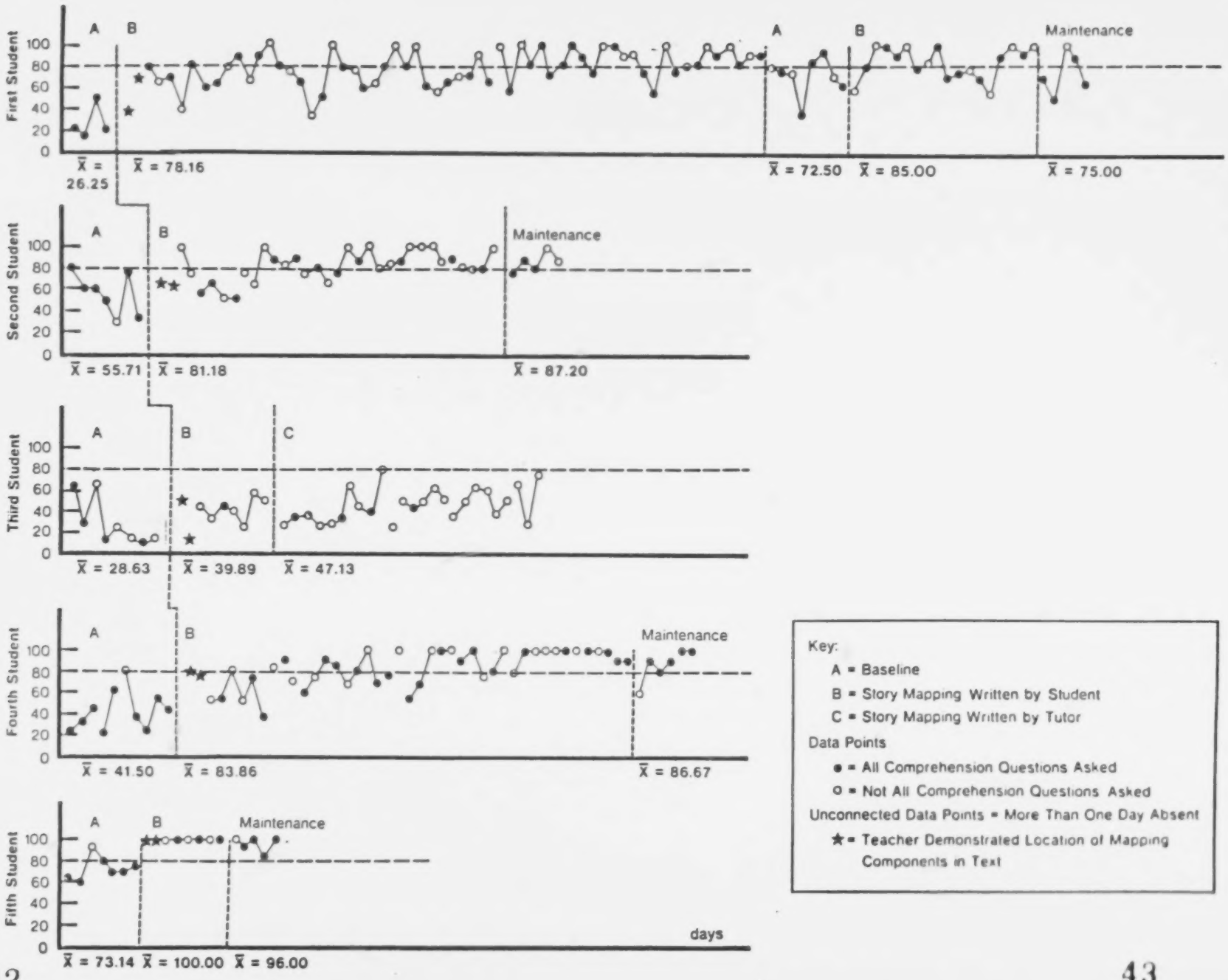
Figure 3. Percent of correctly answered comprehension questions by story components (I) compared to story mapping components referred to in story retell (II); part A.

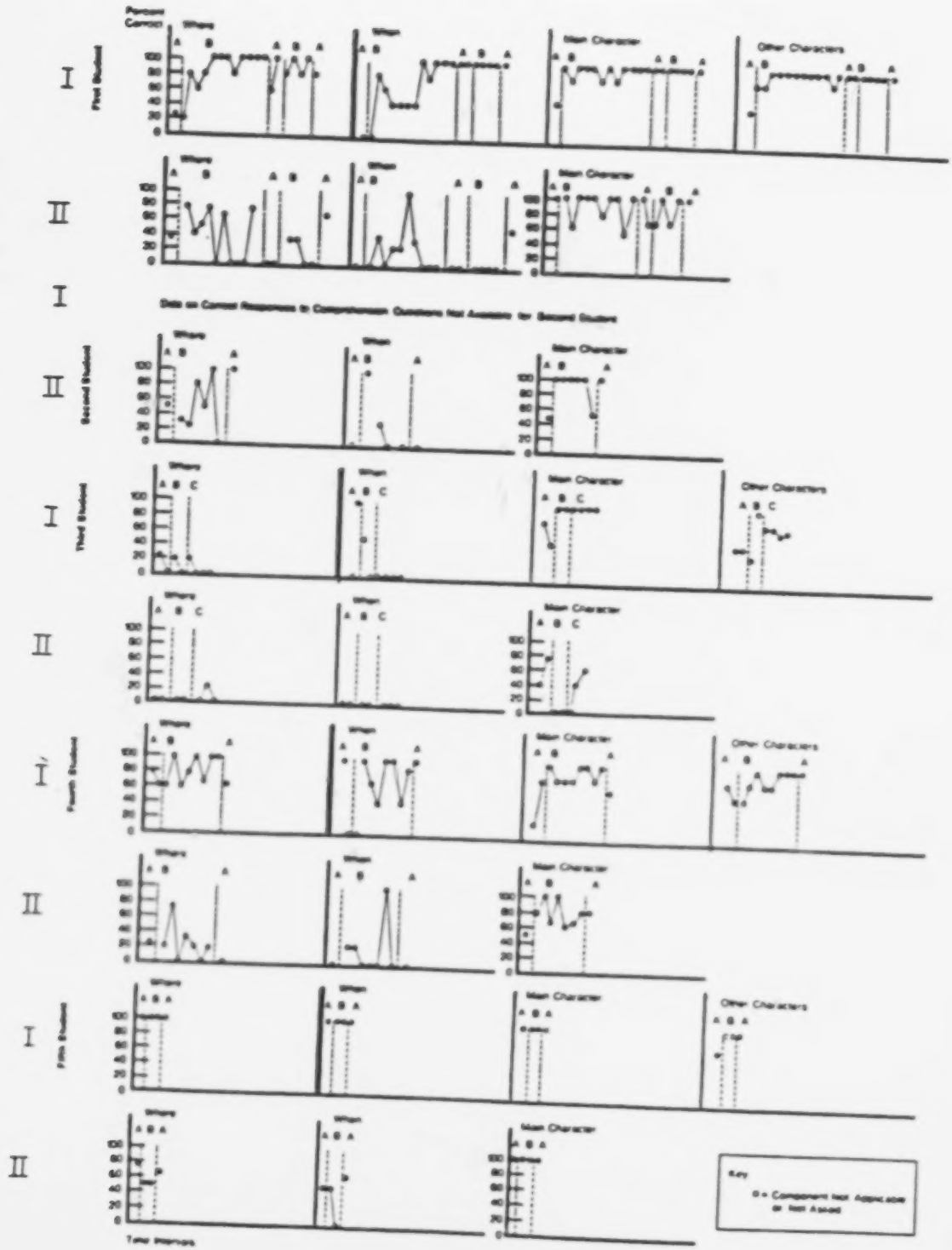
Figure 4. Percent of correctly answered comprehension questions by story components (I) compared to story mapping components referred to in story retell (II); part B.

MY STORY MAP

NAME_____ DATE_____




First Student
A
B
A
B
Maintenance
100
80
60
40
20
0
X̄ = 26.25
X̄ = 78.16
X̄ = 72.50
X̄ = 85.00
X̄ = 75.00
Second Student
A
B
Maintenance
X̄ = 55.71
X̄ = 81.18
X̄ = 87.20
Third Student
A
B
C
X̄ = 28.63
X̄ = 39.89
X̄ = 47.13
Fourth Student
A
B
Maintenance
X̄ = 41.50
X̄ = 83.86
X̄ = 86.67
Fifth Student
A
B
Maintenance
days
X̄ = 73.14
X̄ = 100.00
X̄ = 96.00
Key:
A = Baseline
B = Story Mapping Written by Student
C = Story Mapping Written by Tutor
Data Points
● = All Comprehension Questions Asked
○ = Not All Comprehension Questions Asked
Unconnected Data Points = More Than One Day Absent
★ = Teacher Demonstrated Location of Mapping Components in Text



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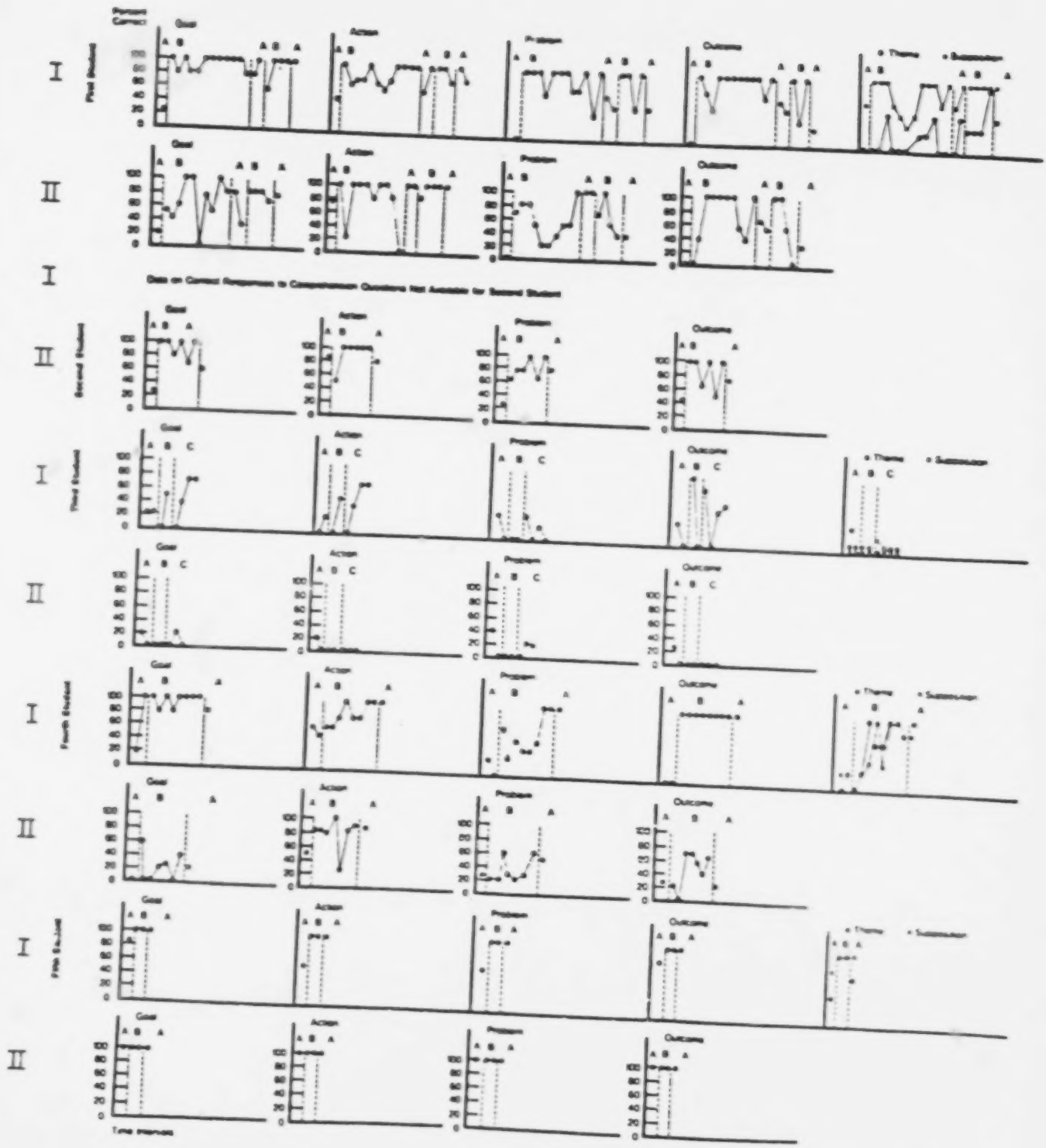

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